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ABSTRACT

A study investigated the effects of a prior knowledge activation strategy on students' ability to successfully engage in the ongoing comprehension of extended text. Data were elicited from 79 ninth graders who were enrolled in a required social studies class in an urban high school in the Southeast. Equal numbers of high and low readers were assigned to each of three treatment groups: prior knowledge activation (PKA) group; main idea (MI) group; and control group. All subjects participated in eight 45-minute instructional sessions followed by four 45-minute testing sessions (three immediate testing sessions and one delayed testing session 4 weeks later). Naturalistic reading passages were selected from the social studies textbook that the students were using, and instructors were mixed across treatments to control for an instructor effect. Results revealed that explicit instruction in how to spontaneously activate prior knowledge during reading had a positive affect on students' ability to answer application level questions. Results also revealed, however, that PKA strategy did not have a significant effect on literal comprehension, and that the MI group performed better on the literal measure, since the treatment focused on encouraging students to target main ideas and supporting details rather than to elaborate from the text. Further research into a strategy combining the tasks of the MI and PKA groups is called for. (One figure and 2 tables of data are included; 18 references are attached.) (KEH)

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Prior Knowledge Activation: Inducing Text Engagement in Reading to Learn

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Prior Knowledge Activation: Inducing Text Engagement in Reading to Learn

Recent investigations in text acquisition demonstrate the substantive role that prior knowledge plays in the comprehension process in terms of schema availability and schema selection (Anderson, Pichert & Shirey, 1983). For example studies have shown that readers with relatively high prior knowledge (i.e., available schema) about baseball (Chiesi, Spilich, & Voss, 1979) and spiders (Pearson, Hansen, and Gordon, 1979) performed significantly better on tests of comprehension than those readers with less background knowledge of the topic. Langer (1981) found that high school students' level of prior knowledge in a content area was significantly related to recall of a content-related passage, and this effect was found to be independent of IQ and the reader's general reading level. Additionally, Chi (1978) showed that children with strongly developed schemata recall, predict and monitor during the comprehension process more like older students than their age mates with less developed knowledge.

In addition to a lack of schema availability for a particular reading content, poor readers may fail to use knowledge they do possess (i.e., schema selection) towards facilitating comprehension. Brown, Bransford, Ferrara, and Campione (1983) suggest that the lack of content knowledge is not only a cause of poor performance, but also a sympton of poor access to the existing knowledge base. They argue that readers of different abilities differ in the degree to which they spontaneously use available information in order to comprehend material, and this in turn contributes to the relative development of the knowledge base. Oakhill (1984) found that skilled comprehenders typically are superior to poor readers in their ability to draw inferences within a text, and claims that they are also more likely than poor comprehenders to use their relevant general knowledge when comprehending implied information in a text. Bransford, Stein, Shelton, and Owings (1981) found that only academically successful students were able to spontaneously make use of previously provided important information necessary for understanding subsequent portions of a text; less successful students required specific prompts in order to make use of the information.

Existing research provides ample support for the efficacy of schema activation as a prereading strategy in order to promote active reader involvement. Prereading strategies have been used successfully as background knowledge builders as well as prior knowledge activators (Graves, Cook & Laberge, 1983). Prereading strategies, however, may not suffice in assisting students with ongoing active engagement with extended text. The absence of ongoing schema selection throughout a reading task may lead to underutilization of preexisting knowledge and may ultimately result in reduced comprehension performance (Pearson & Spiro, 1982).

In light of the preceding observations, a study was designed to investigate the effects of a prior knowledge activation strategy on students' ability to successfully engage in the ongoing comprehension of extended text. The study focused on explicit instruction (see Pearson & Gallagher, 1983; Spires & Stone, 1989) through teacher modeling of how to relate ideas from the text to an existing knowledge base. The rationale for modeling prior knowledge activation was based in part on the recent claim that reading is a

strategic process (see Paris, Lipson, & Wixson, 1983). Research indicates that some readers readers do not skim, scan, reread, integrate new information, plan ahead, take notes, make inferences, as often as other readers (Anderson & Armbruster, 1982; Golinkoff, 1976). In attempting to explain the reasons for these deficits, Paris, et al. suggest that less skilled readers have little knowledge of how text features, task goals, strategies and learner characteristics influence reading. They argue that educators need to provide more information directly and explicitly so that readers can elaborate and refine their understanding of the reading process. One way to provide explicit instruction in strategy use, (i.e., prior knowledge activation) is through teacher modeling and think aloud techniques (see Duffy, Roehler, & Hermman, 1988; Nist & Kirby, 1986). The study addressed the following research questions:

1) What are the effects of prior knowledge activation (PKA) strategy trainingon comprehension of expository prose?
2) What are the effects of PKA strategy training on the comprehension performance of high and low ability readers?
3) What are the effects of PKA strategy training to comprehension of narrative prose (transfer measure)?
4) What are the effects of PKA strategy training on comprehension of expository prose one month after training (delayed measure)?
5) What are the differential effects of PKA strategy training when compared to traditional main idea (MI) strategy training and a control on comprehension of expository prose?

Method

Subjects

The subjects were 121 ninth graders who were enrolled in a required social studies class in an urban high school in the southeast. Equal numbers of high and low readers (as measured by the comprehension subtest of the California Achievement Test) were assigned to each of three treatment groups through stratified random sampling. To further assess the homogeneity of the groups, mean scores were calculated on the comprehension subtests of the CAT. A one-way ANOVA revealed no significant differences across groups. Those students who missed more than one day of training or who were absent during any of the testing sessions were excluded from the analysis. Additionally, students whose California Achievement Test scores were not available also were omitted. This left a total of 79 subjects for the analysis.

Materials

Naturalistic reading passages for both instructional and testing purposes were selected from the social studies textbook that the students were presently using in order to increase the opportunity for transfer to authentic academic reading tasks. Reading material used during instruction came directly from the social studies textbook and was limited to a chapter that the students previously had not covered in class. Test materials consisted of four comprehension tests comprised of both literal and application level questions. Passages were approximately 2000 words in length and reading level was appropriate for ninth graders. The

social studies passages included topics on the family, ecology, and civil rights. Additionally, a short story was included as a fourth passage to assess the transfer effects of the strategy to a narrative format. All passages and corresponding tests were critiqued by three social studies teachers and one reading specialist in order to establish content validity. Materials and procedures then were pilot tested on a subset of the target population. Reliability coefficients for the four passages were .79, .85, .80, and .83, respectively.

Procedures

Subjects were randomly assigned to one of three groups: prior knowledge activation group (N=24); main idea group (N=25); and a control group (N=30). All subjects participated in eight 45 minute instructional sessions followed by four 45 minute testing sessions (three immediate testing sessions and one delayed testing session four weeks later). Instructors were mixed across treatments to control for an instructor effect.

Experimental Treatments. Both the prior knowledge activation (PKA) group and the main idea (MI) group received instruction in their respective strategies according to a model of explicit instruction . Figure 1 used in a study by Spires & Stone (1989) and adapted from Pearson & Gallagher (1983) depicts the various stages and progression of instruction in which the teacher involved the students. Explicit instruction is based on Vygotsky's (1976) notion of learning as the result of social interaction and Bruner's concept of scaffolding (Bruner,1979). In both groups the teachers began instruction by providing an extensive rationale for why the strategy was going to be useful to the students and how it was going to help them comprehend written text more fully. Then the teachers began modeling the use of the strategy and verbalizing the thinking that accompanied the execution of the task. For example, the PKA instructor read aloud a portion of the text and then provided an elaboration by directly relating an idea in the text to information she already possessed; the MI instructor read aloud a portion of the text and then verbalized how she decided what the main idea and supporting details were.

The teachers then provided opportunities for guided practice in which teachers and students worked jointly to complete the task. During the guided practice phase students also worked in small groups and then received feedback from both teachers and peers. Over the duration of instruction, teachers gradually released the responsibility for task completion to the student (i.e., the process of scaffolding) and by the end of the instructional phase students were operating at an independent level with their strategy. For example, by the last three days of instruction, PKA students were writing their elaborations spontaneously out to the side of the text; and MI students were writing main ideas and supporting details in a split-page notetaking format. (see Spires & Stone, 1989). Both groups were shown the model of explicit instruction prior to each instructional session and the teacher provided a rationale for how the activities for that day would progress according to the model.

Control Treatment. The control group received the same reading materials as the experimental groups for both instruction and testing. The instructional phase consisted of having students read a designated portion of the text and then answer corresponding questions at the end of the chapter. At the end of each session, the instructor provided students with feedback on correct answers. The rationale presented to the students was that engaging in sustained silent reading over a period of time would provide them with reading practice which hopefully would affect their reading performance.

Dependent Measures

Dependent measures consisted of three immediate measures and one delayed measure. The first two measures were over expository material similar to the type that was used in instruction. The third measure was used in conjunction with a short story to assess the transfer effects of strategy training to narrative prose. The delayed measure was administered one month after instruction to see if the students continued to benefit from the strategy instruction.

The dependent measures consisted of literal and application level questions. There were ten literal level questions for each test with the exception of the narrative test which only had six questions. All literal questions were in multiple choice format. Application questions were made up of five discussion and five multiple choice questions with the exception of the narrative test which had six discussion questions only. Discussion questions were scored by two raters using criteria which targeted both quality and quantity of student elaborations. For each discussion question, students could score between zero and three points. The inter-rater reliability ranged from .80 to 1 for each of the discussion questions.

Results

A preliminary 3 (treatment) X 2 (ability) MANOVA was run for the entire set of dependent measures. This allowed for the study of interactions between group and reading ability as well as for main effects for these two independent variables. The results of the analysis revealed a significant main effect for ability but no interactions between treatment and ability; therefore the ability groups were collapsed and a one-way MANCOVA was run across treatment groups using reading ability as a covariate. Wilkes Lambda was used as the multivariate test of criteria. The overall value of this statistic showed a significant main effect for group, $F(16, 136)=4.01$, $p=.0001$.

Literal-level Comprehension. Univariate F tests for literal comprehension yielded significant main effects for group for one of the four tests, Test 2, $F(2,75) = 4.47$, $p=.01$. Post-hoc analyses indicated that the main idea group outperformed both the prior knowledge and control groups, while there was no difference between the prior knowledge group and the control group. There was a marginally significant effect for Test 4, $F(2,75) = 2.70$, $p = .07$. Post-hoc analyses suggested again that the main idea group outperformed both the prior knowledge group and the control group, while no difference existed between prior knowledge and control groups.

Insert Table 1 about here

Application-level Comprehension. In order to attain a total application score, the scores for the multiple choice and open-ended questions were combined for initial analyses. Univariate F tests for application-level comprehension yielded significant main effects for group for all four tests. In Test 1, $F(2,75) = 15.01$, $p = .0001$, post-hoc analyses indicated that the prior knowledge group outperformed both the main idea group and the control group, and there was no significant difference between main idea and control. In Test 2, F (2,

75) = 11.77, p = .0001, post-hoc analyses indicated that the prior knowledge group again outperformed both the main idea group and the control group, while the control group outperformed the main idea group. For Test 3, F (2, 75) = 3.48, p = .04, post-hoc analyses indicated that the prior knowledge group significantly outperformed the control group but was only marginally significant over the main idea group. There was no significanct difference between the main idea group and the control group. For Test 4, F (2,75) = 5.61, p = .005, post-hoc analyses indicated that the prior knowledge group significantly outperformed both the main idea and the control groups, and there was no significant difference between main idea and control.

Insert Table 2 about here

Implications

The results of this study suggest that explicit instruction in how to spontaneously activate prior knowledge during reading may positively affect students' ability to answer application level questions. The PKA strategy, however, did not have a significant effect on literal comprehension although the PKA group typically outperformed the control group. It is not surprising that the MI group performed better on the literal measure (although not always significantly better) since the treatment focused on encouraging students to target main ideas and supporting details rather than to elaborate from the text. It appears that having students engage in prior knowledge activation during reading provides practice with thinking beyond the text. This type of thinking then appears to carry over into question answering that requires the student to go beyond the text. Of interest is that the PKA strategy effectiveness appears to transfer to narrative prose even though the training was conducted on expository prose. The fact that the PKA group scored significantly better on the delayed measure over both the MI and control groups indicates the potential for this strategy to be internalized by students. It is possible that students feel positive about being allowed to bring their personal knowledge to bear on reading tasks that typically may be perceived as impersonal and feel more personally invested in the reading task.

Since the PKA group scored below the MI group on literal comprehension, it appears that the PKA strategy may distract the reader from focusing on factual information in the text. Obviously, in an academic reading situation, the successful reader is expected to comprehend literally what the text is presenting as well as think beyond the text on an application level. It is possible that a strategy that combines the tasks of the MI and PKA groups may yield a more well rounded comprehension experience for the reader. Future research should address this issue as well as attempt to provide more information about the effects of the PKA strategy when used in conjunction with a variety of subject area texts.

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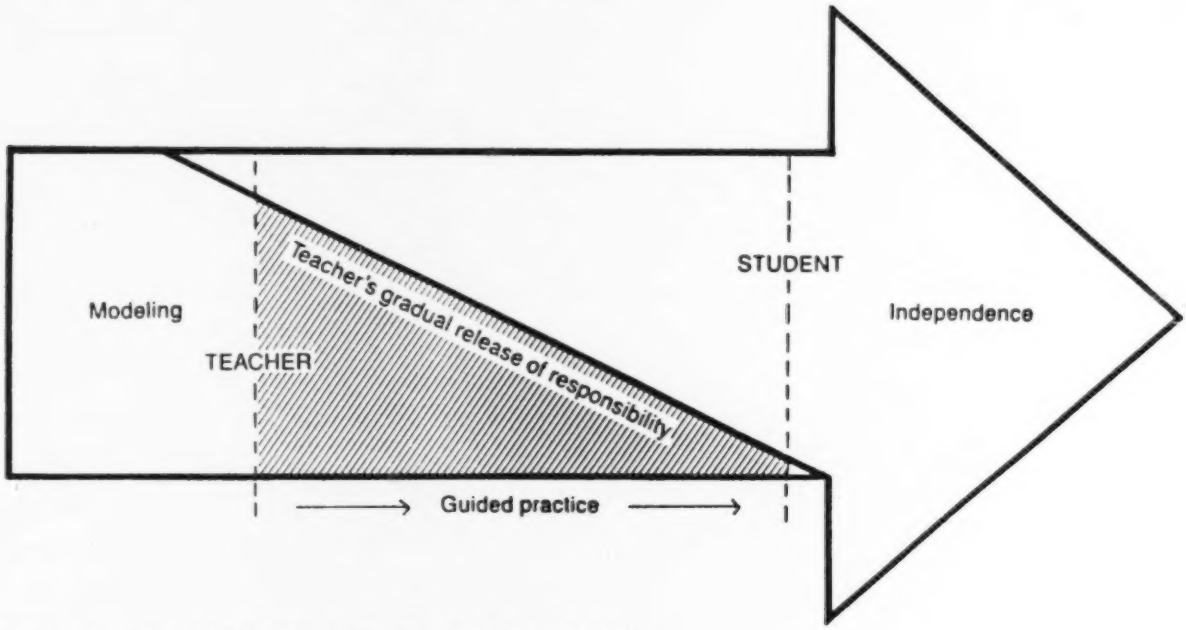
Figure 1
Shift of responsibility for task completion during instruction



Spires & Stone (1989) after Pearson & Gallagher (1983).

TABLE 1. MEANS AND STANDARD DEVIATIONS FOR LITERAL COMPREHENSION MEASURES

	TEST 1		TEST 2		TRANSFER		DELAYED	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
PRIOR KNOWLEDGE (N = 24)	8.58 (8.49)	1.69	8.63 (8.53)	1.76	4.63 (4.54)	1.66	7.21 (7.11)	1.64
MAIN IDEA (N = 25)	8.72 (8.66)	1.21	9.48 (9.42)	0.71	4.68 (4.63)	1.65	7.92 (7.86)	1.38
CONTROL (N = 30)	8.30 (8.42)	1.62	8.67 (8.79)	1.60	4.60 (4.71)	1.28	7.00 (7.12)	1.78

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* NOTE: Adjusted means are shown in parentheses.
** NOTE: The total possible number of points for Tests 1, 2, and Delayed Tests was 10, while the total possible number of points for the Transfer Test was 6.

TABLE 2. MEANS AND STANDARD DEVIATIONS FOR APPLICATION COMPREHENSION MEASURES

	TEST 1		TEST 2		TRANSFER		DELAYED	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
PRIOR KNOWLEDGE (N = 24)	15.41 (15.25)	3.39	14.75 (14.52)	3.23	9.70 (9.54)	3.90	11.71 (11.51)	3.78
MAIN IDEA (N = 25)	10.80 (10.70)	3.19	10.68 (10.54)	3.41	8.10 (7.98)	3.35	8.80 (8.68)	3.52
CONTROL (N = 30)	11.33 (11.55)	3.85	12.60 (12.90)	4.20	7.10 (7.31)	3.32	9.17 (9.43)	3.66

* NOTE: Adjusted means are shown in parentheses.
** NOTE: The total possible number of points for Tests 1, 2, and Delayed Tests was 20, while the total possible number of points for the Transfer Test was 18.